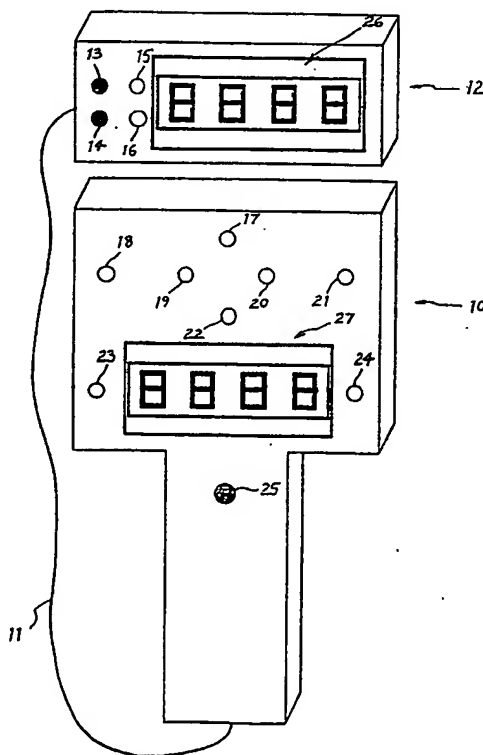


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(21) International Application Number: PCT/AU93/00072 (22) International Filing Date: 18 February 1993 (18.02.93) (30) Priority data: PL 1018 21 February 1992 (21.02.92) AU (71)(72) Applicant and Inventor: GOMEZ, Julio, Antonio [AU/ AU]; 4/51 Gloucester Road, Hurstville, NSW 2220 (AU). (74) Agent: MAXWELL, Peter, Francis; Peter Maxwell & Asso- ciates, Blaxland House, 5 Ross Street, North Parramatta, NSW 2151 (AU).		(81) Designated States: AU, CA, JP, NZ, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
(54) Title: REFLEX TESTER (57) Abstract An apparatus (10) for testing the reflex reaction time of a person, such as a potential driver of a vehicle, includes means (40) for generating a visual signal and means (17 to 21) for displaying randomly the visual signal at any of a predetermined number of locations visible to the person. There is a manual pressure receiving means (25) on the apparatus (10) that is adapted to be pressed when the person observes the random visual signal. The elapsed time between display of the visual signal and receiving the manual pressure on the means (25) is measured and displayed by a display means (27) such as a digital display. The apparatus (10) may be adapted for use with a display device (12) to which it is remotely connected by wiring (11) such that the display device (12) displays the elapsed time to a second person.		



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REFLEX TESTERFIELD OF THE INVENTION

The present invention relates to reflex testers and, in particular, to apparatus for testing the reflex reaction time of vehicle drivers and the like so as to identify potentially dangerous drivers. The specification will describe the application of the invention to vehicle drivers but it is to be understood that the invention is not limited thereto and can be extended to pilots of aircraft or sea vessels and machine operators.

BACKGROUND ART

The detection of potentially dangerous drivers, for instance, is of critical importance in ensuring that there is a high level of safety on roads for the benefit of all road users, including pedestrians. With the introduction of faster and better performance vehicles, there remains a tendency, however, for drivers to drive their vehicles above the legal speed limit operating on any particular road. Coupled with this is an overall shift in emphasis of vehicle design towards greater reliance on vehicle borne automated control systems, such as cruise control and advanced suspension systems, so that the driver need rely less on his or her judgement to control the speed or behaviour of the vehicle by manually operable means.

This has led to some drivers becoming complacent about safety and being unable to respond quickly enough to random events occurring on the road, with the result that accidents occur.

It is therefore of ever increasing importance that means be developed for testing driver reflex reaction time, so that, in time, this may be incorporated in the initial or periodic testing of driving skills.

Equally important would be the use of such testing means for the identification of potentially dangerous drivers.

Conventionally, potentially dangerous drivers have been detected by the relatively crude method of indirectly measuring the concentration of alcohol in the driver's blood stream by breath analysis.

Studies have shown that alcohol tolerance in humans relates to several physical and emotional factors. Consequently the Australian authorities have set a rigid, low alcohol concentration limit of 0.05% 'across the board' for drivers and machinery operators, and zero for pilots.

However, this concentration limit still does not take into account variations in some drivers natural alcohol tolerance and so the situation may arise where a driver having a blood alcohol concentration above the legal limit is able to drive safely and without risk of causing an accident. For some other drivers, alcohol induced impaired driving ability may occur where there is a blood alcohol concentration below the legal limit.

Indeed, impairment of driving ability, and most prominently, slowed reflex reaction time, need not occur through alcohol abuse only, but may occur through both legal and illegal drugs, driver fatigue, physical and emotional

factors, sickness and old age.

Focus should therefore be placed on driver reflex reaction time as a measure of driving ability rather than blood alcohol concentration.

It is therefore an object of the present invention to overcome or substantially ameliorate the disadvantages of the prior art.

DISCLOSURE OF THE INVENTION

According to the invention there is provided an apparatus for testing the reflex reaction time of a person, comprising:-

means for generating a visual signal,

means for displaying randomly the visual signal at any of a predetermined number of locations visible to the person,

means for receiving manual pressure exerted by the person,

means for measuring the elapsed time between display of visual signal and receiving the manual pressure, and

means for displaying the elapsed time.

In another embodiment of the invention, the apparatus is remotely connected to a display device which is adapted to separately display the elapsed time to a second person.

The visual signal may be generated by a battery which may generate the visual signal at intervals of between 1 to 3 seconds apart.

Preferably, the visual signals are displayed with light emitting diodes which may be located in a symmetrical pattern on the apparatus.

The manual pressure receiving means may comprise a push button.

The elapsed time measuring means may include a timer which is activated when a signal is displayed and a timer stop means which is activated to stop the timer when pressure is exerted on the manual pressure receiving means.

In another form of the invention, the visual signal is a computerized simulation display of a dangerous driving situation, the display being at one location visible to the person, and the manual pressure receiving means is used to test the reflex time of that person in that simulated dangerous driving situation.

According to another aspect of the invention, there is provided a method for testing the reflex reaction time of a person, the method comprising:-

- (a) generating a visual signal,
- (b) displaying randomly the visual signal at any one of a predetermined number of locations visible to the person,
- (c) applying manual pressure exerted by the person on a receiving means,
- (d) measuring the elapsed time between displaying the visual signal and exerting the manual pressure, and,
- (e) displaying the elapsed time.

Preferably, the method comprises the use of the aforementioned apparatus.

In another embodiment of the invention, there is provided a method for testing the reflex reaction time of a

vehicle driver and the like so as to identify whether that driver is a potentially dangerous driver, the method comprising:-

- (a) generating a visual signal,
- (b) displaying randomly the visual signal at any one of a predetermined number of locations visible to the person,
- (c) applying manual pressure exerted by the person on a receiving means,
- (d) measuring the elapsed time between displaying the visual signal and exerting the manual pressure,
- (e) displaying the elapsed time, and
- (f) comparing the elapsed time with the allowable time range.

BRIEF DESCRIPTION OF THE DRAWINGS

In order that the invention may be more readily understood and put into practical effect, reference will be made to the accompanying drawings, in which:-

Fig. 1 is an isometric view of a reflex reaction testing apparatus according to a preferred embodiment of the invention along with a remotely connected display device,

Fig. 2 is a chart showing reflex time versus age for 50 normal drivers subjected to a testing procedure using the apparatus of Fig. 1,

Fig. 3 is a chart showing reflex time versus various age brackets based on the same data used in Fig. 2,

Fig. 4 is a block diagram of circuitry of the apparatus and device of Fig. 1, and
Fig. 5 is a flow chart of the steps of a preferred testing procedure using the apparatus of Fig. 1.

DESCRIPTION OF PREFERRED EMBODIMENTS

The reflex reaction testing apparatus 10 shown in Fig. 1 consists of a hand held substantially T-shaped box that can be fabricated of any durable material, such as plastic, aluminium and the like.

The apparatus 10 is electrically connected by wiring 11 to a referee control and display device 12 made of a similar material to that of the apparatus 10.

The display device 12 has a switch 13 and push-button 14 that activate the testing apparatus 10, and are identified as 'on' by the pilot lights 15 and 16.

The testing apparatus 10 has six test lights 17 to 22 symmetrically arranged thereon, a pair of pilot lights 23 and 24 that identify the 'standby' and 'ready' modes respectively, and a push-button 25.

Both the testing apparatus 10 and display device 12 have numeric displays 26 and 27 respectively.

In use, the switch 13 is pressed to its 'on' position to activate the apparatus 10 to 'standby' mode. The 'standby' lights 15 and 23 are thereby illuminated. The push-button 14 may then be pressed to begin the random lighting procedure of the test lights 17 to 22. The 'ready' lights 16 and 24 are thereby illuminated.

Between 3 and 4 seconds after pressing the push-button 14 a light will appear on any one of the test lights 17 to 22, the particular test light being chosen at random.

The subject of the test or driver must press the push-button 25 on the testing apparatus 10 as soon as he or she notices the light and the time elapsed between the illumination of the light and the pressing of the push-button 25, which is a measure of the reflex reaction time of the subject, will be displayed on both displays 26 and 27.

The referee or tester can then compare the displayed elapsed time with the allowable time range to determine whether the reflex reaction time is at a safe level.

The random lighting procedure can be repeated a number of times as desired to obtain a mean reflex reaction time indicative of the particular subject. Preferably, the procedure will be repeated five times.

An allowable reflex reaction time range may be developed through experimental testing.

The present inventor has conducted tests of 50 normal drivers between the ages of 17 and 60 to collect data that may be used in developing such an allowable time range. Once familiarized with the testing procedure, the drivers were subjected to 2 rounds of 5 tests per round so that 10 data readings were obtained. Each round was averaged and the lower of the two averages was represented graphically on a reflex time (Y axis) versus age (X axis) chart. This chart is shown in Fig. 2.

Referring to the chart of Fig. 2, the continuous or full line represents the actual values derived by the testing procedure, and the discontinuous or dotted line represents graphically the trend or tendency of movement of the actual values. The line representing the trend is the result of charting age data against modified reflex data. The reflex data is modified by a mathematical formula that calculates 20% of the actual reading and adds to it 80% of the previous reading.

A chart of reflex time (Y axis) versus age bracket (X axis) was prepared with the same data showing actual value lines and trend value lines for the following age brackets:

Age 17 to 29 under age bracket 20

Age 30 to 39 under age bracket 30

Age 40 to 49 under age bracket 40

Age 50 to 60 under age bracket 50

This chart is shown in Fig. 3.

Statistical analysis of the results indicates that there is no significant difference in reflex times between age brackets and that all age brackets have similar trends. It is concluded from these results therefore that reflex time is a unique feature of each person and that there is no basis for developing allowable reflex time ranges dependent on age.

However, the results can be used to develop an allowable reflex reaction time range that is relevant across all age brackets.

The determination of that time range will require careful comparison of the reaction time of normal drivers

against drivers that are influenced by factors that are normally regarded as impairing their driving ability.

The block diagram shown in Fig. 4 summarizes the order of the circuitry of the testing apparatus 10 and display device 12.

The flow chart shown in Fig. 5 summarizes the order of steps that are required for operation of the testing procedure and refers, in part, to Fig. 4.

According to the circuitry diagram of Fig. 4 and flow chart of Fig. 5, the tester activates the 'standby' switch 13 whereby 'standby' pilot lights 15 and 16 are illuminated. The 'ready' pushbutton 14 is then pressed by the tester to complete the circuit, and to illuminate 'ready' pilot lights 16 and 24. The logic controller 40 includes a first logic function 41, a random selector function 42, a timer 43, a second logic function 44, a reset function 45 and an integrator function 46. The timer 43 is powered by a 12MHz crystal.

The first logic function 41 causes the test lighting procedure to be carried out 5 successive times with an interval of 3 to 4 seconds therebetween. The random selector function 42 selects at random one test light or light emitting diode 17 to 22, and through a driver unit 47 and resistors 48 illuminates the selected test light. The timer 43 is activated only when the selected test light is illuminated.

The second logic function 44 activates the numeric displays 26 and 27 as well as the integrator function 46

which stores the readings and displays the average.

When the subject driver presses the 'stop' pushbutton 25 to signal recognition of the test light, the elapsed time since the timer 43 was initiated is displayed on numeric displays 26 and 27 via brightness controlled display drivers 48 and 49 respectively and voltage regulators 50 and 51 respectively. The elapsed time reading is also stored by the integrator function 46. The reset function 45 then causes the test light to be switched off and then displays 26 and 27 to return to a zero reading to await another process of random test light illumination.

After 5 readings have been taken, the pressing of the 'ready' pushbutton 14 by the tester causes the displays 26 and 27 to show the average of the 5 readings. Subsequent pressing of the 'ready' pushbutton 14 causes the average reading to be compared with the allowable range and if the average reading is within the allowable range, the displays will show 'PASS'. If the average reading is greater than the allowable range, the displays will show 'FAIL'.

The tester may conduct another round of 5 random test light illuminations to obtain a second average reading by following the same procedure as described above.

Various modifications may be made in details of design, construction and method steps without departing from the scope or ambit of the invention.

For instance, when the visual signal is a computerized simulation display of a dangerous driving situation, the simulation display may take either of the forms commonly

known as "virtual reality" or "video graphic".

The reflex reaction time testing apparatus of the invention may be located permanently on the instrumentation board of a vehicle so that it is able to prevent ignition of the engine of the vehicle if the potential driver does not satisfy the reaction time requirements. The vehicle will therefore be disabled and the opportunity for that driver to drive that vehicle on the road is removed.

The testing apparatus may be a dedicated part of the on-board computer of the vehicle, or a portable unit that includes means for connection to the ignition circuit or on-board computer of the vehicle.

The visual signal may be displayed somewhere on the instrumentation board and the manual pressure receiving means may comprise the foot operated break pedal of the vehicle.



SUBSTITUTE SHEET

CLAIMS

1. An apparatus for testing the reflex reaction time of a person, comprising:-

means for generating a visual signal,

means for displaying randomly the visual signal at any of a predetermined number of locations visible to the person,

means for receiving manual pressure exerted by the person,

means for measuring the elapsed time between display of visual signal and receiving the manual pressure, and

means for displaying the elapsed time.

2. The apparatus of claim 1 wherein the apparatus is remotely connected to a display device which is adapted to separately display the elapsed time to a second person.

3. The apparatus of claim 1 or claim 2 wherein the visual signal is generated by a battery which generates the visual signal at intervals of between 1 to 3 seconds apart.

4. The apparatus of any one of claims 1 to 3 wherein the visual signals are displayed with light emitting diodes which are located in a symmetrical pattern on the apparatus.

5. The apparatus of any one of claims 1 to 4 wherein manual pressure receiving means comprises a push button.

6. The apparatus of any one of claims 1 to 5 wherein the elapsed time measuring means includes a timer which is activated when a signal is displayed and a timer stop means which is activated to stop the timer when pressure is exerted on the manual pressure receiving means.

7. The apparatus of claim 1 wherein the visual signal is a

computerized simulation display of a dangerous driving situation, the display being at one location visible to the person, and the manual pressure receiving means is used to test the reflex time of that person in that simulated dangerous driving situation.

8. A method for testing the reflex reaction time of a person, the method comprising:-

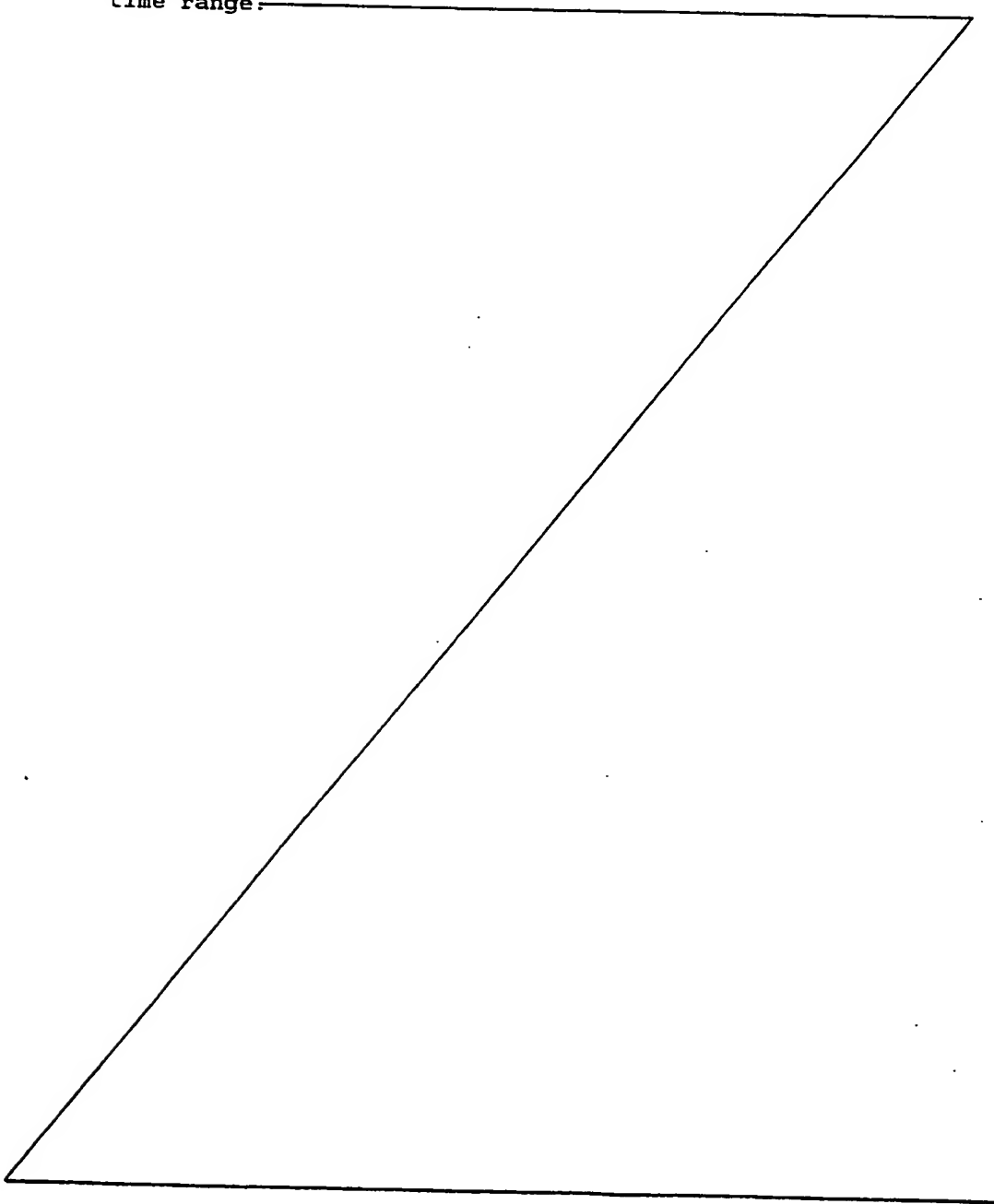
- (a) generating a visual signal,
- (b) displaying randomly the visual signal at any one of a predetermined number of locations visible to the person,
- (c) applying manual pressure exerted by the person on a receiving means,
- (d) measuring the elapsed time between displaying the visual signal and exerting the manual pressure, and,
- (e) displaying the elapsed time.

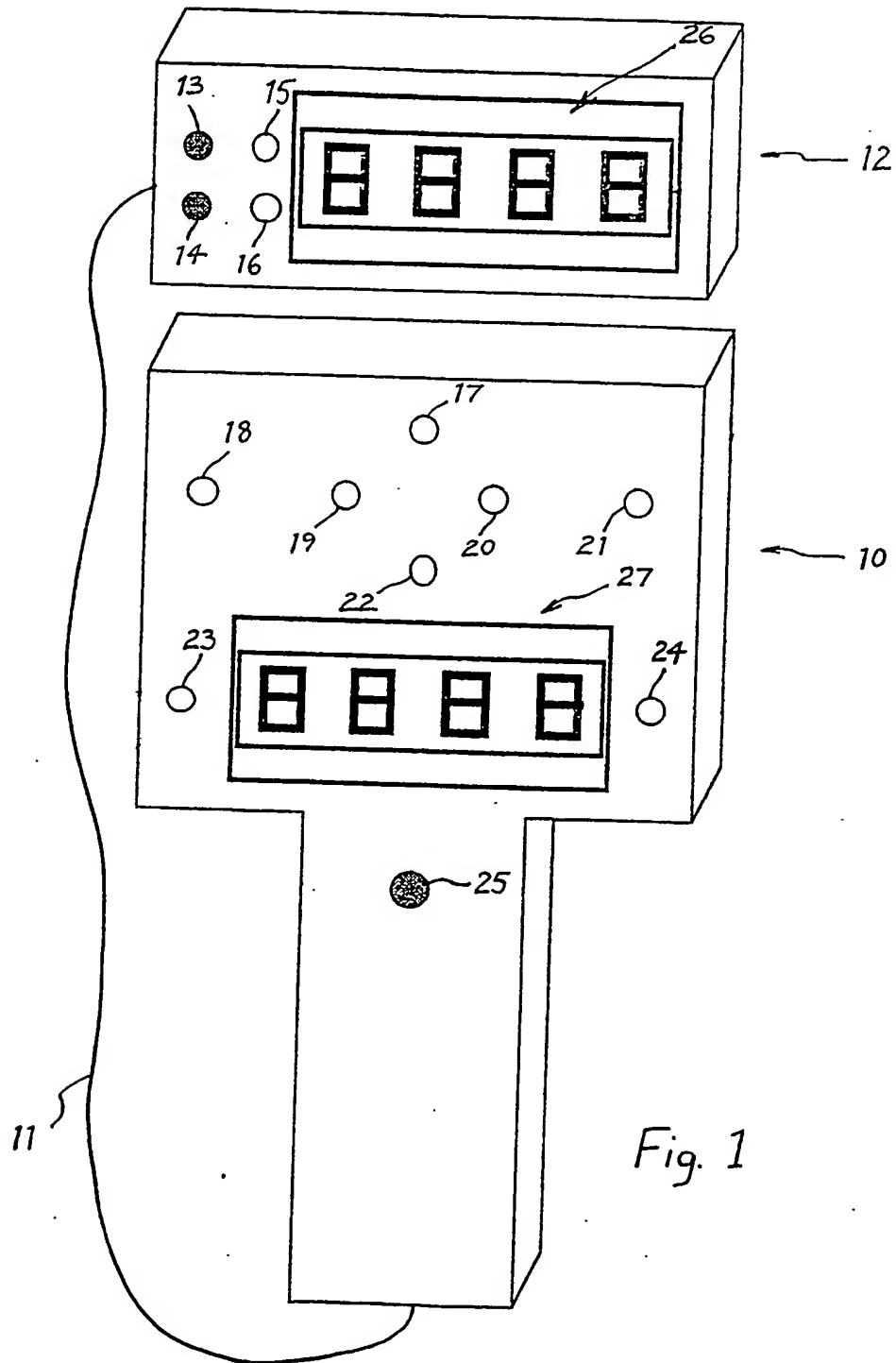
9. The method of claim 8 wherein the steps (a) to (e) are carried out with the apparatus of any one of claims 1 to 6.

10. A method for testing the reflex reaction time of a vehicle driver and the like so as to identify whether that driver is a potentially dangerous driver, the method comprising:-

- (a) generating a visual signal,
- (b) displaying randomly the visual signal at any one of a predetermined number of locations visible to the person,
- (c) applying manual pressure exerted by the person on a receiving means,

- (d) measuring the elapsed time between displaying the visual signal and exerting the manual pressure,
- (e) displaying the elapsed time, and
- (f) comparing the elapsed time with the allowable time range.





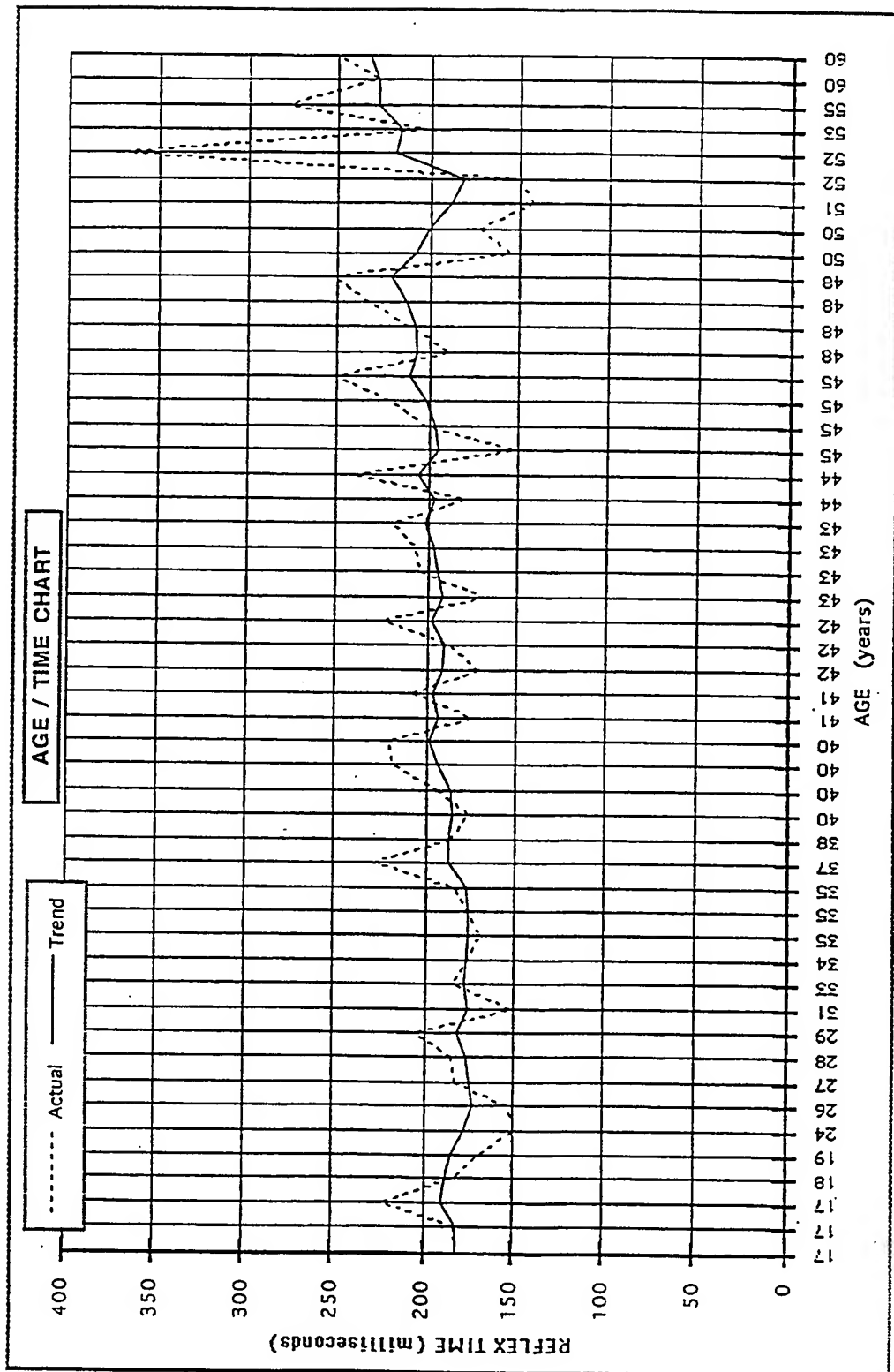


Fig. 2

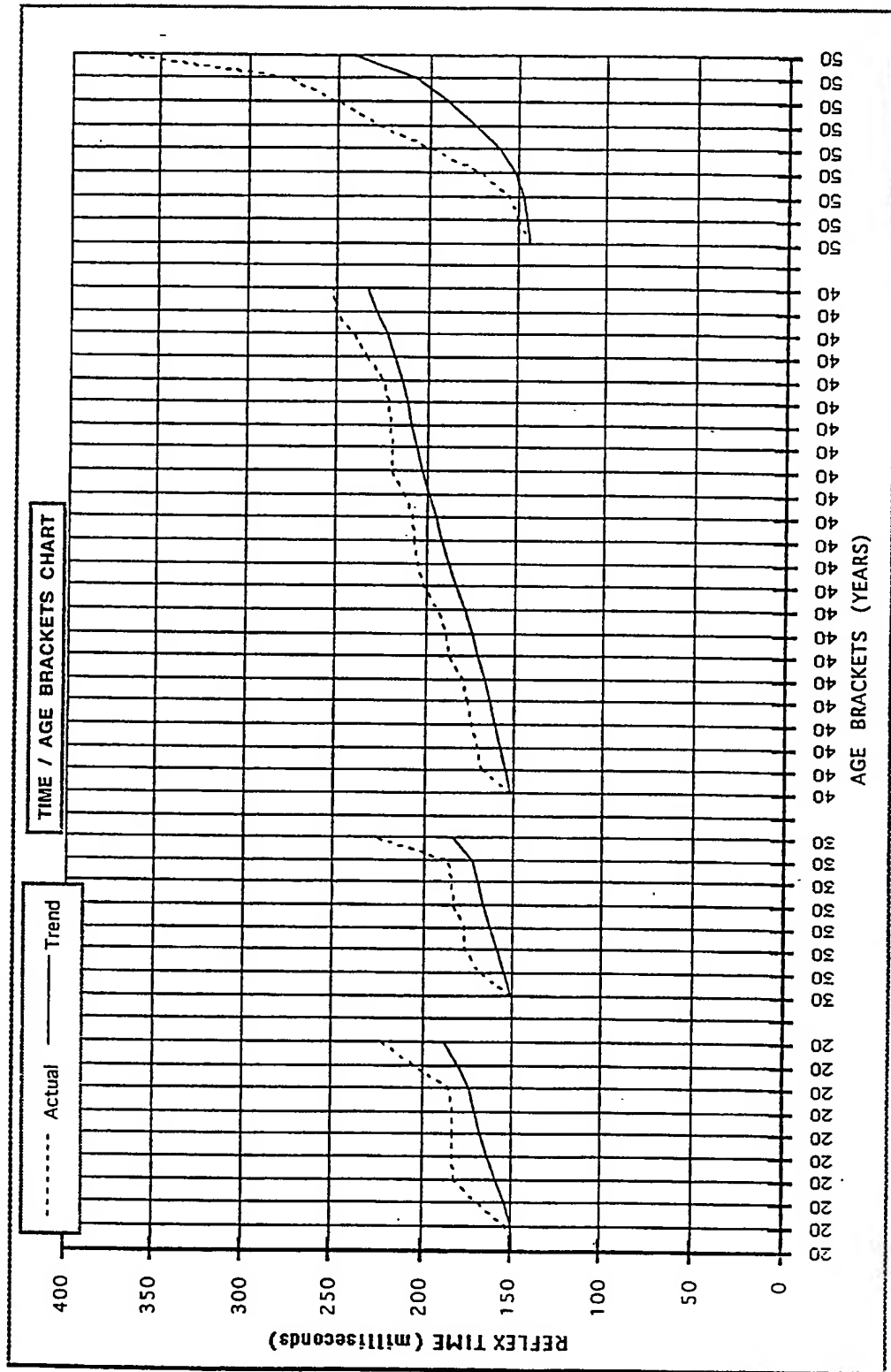
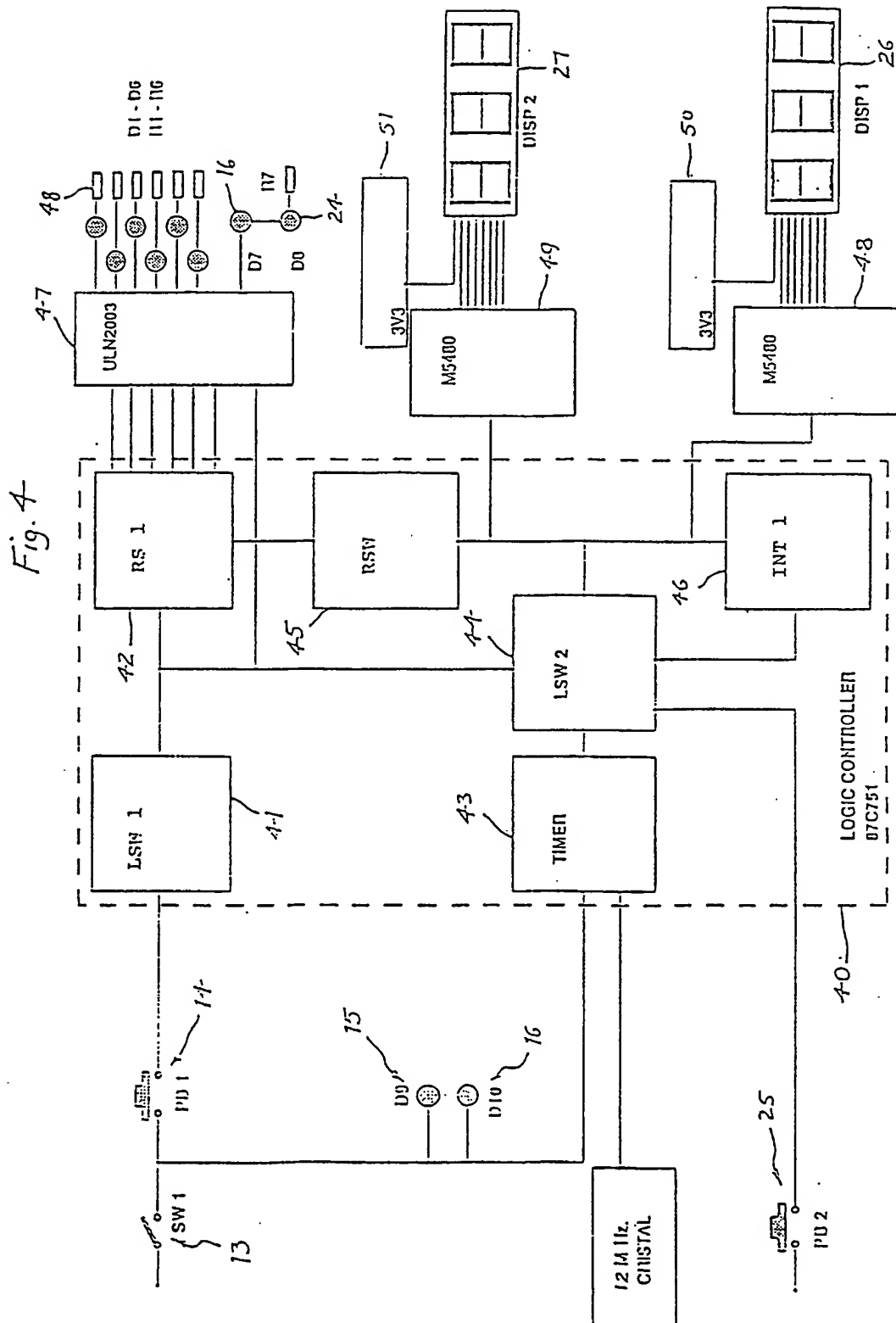
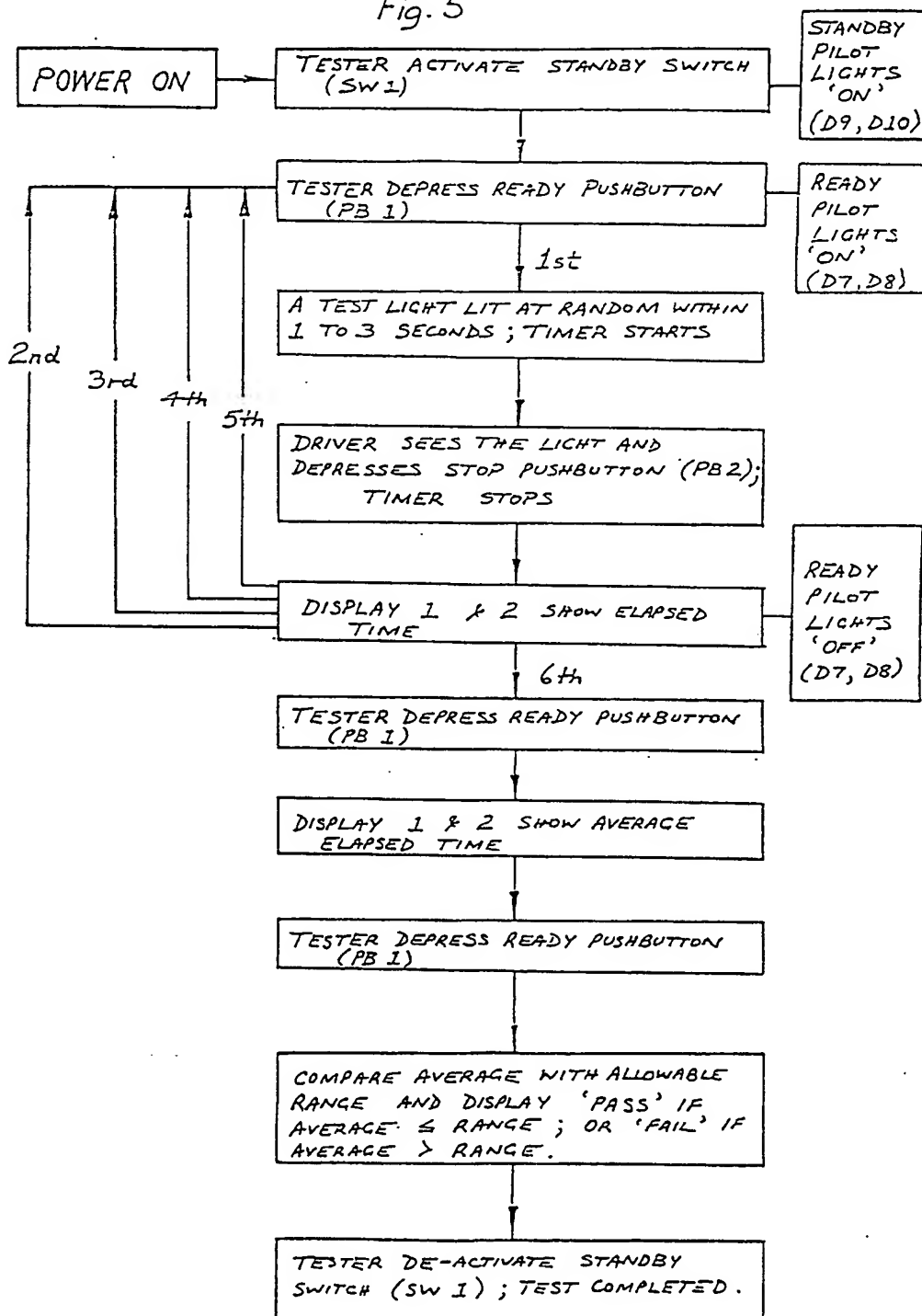


Fig. 3




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Fig. 5



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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.																				
Y,A	GB,A,2115958 (SELLMATIC OY) 14 September 1983 (14.09.83) See page 1 column 1	1,2,4-6,8,9																				
Y	AU,A,23180/88 (S.B. MARKETING AB) 11 May 1989 (11.05.89) See page 1	1,2,4-6,8,9																				
A	DE,A1,2947536 (HAEFHER) 4 June 1981 (04.06.81) Whole document																					
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Date of the actual completion of the international search 17 May 1993 (17.05.93)		Date of mailing of the international search report 24 MAY 1993 (24.05.93)																				
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